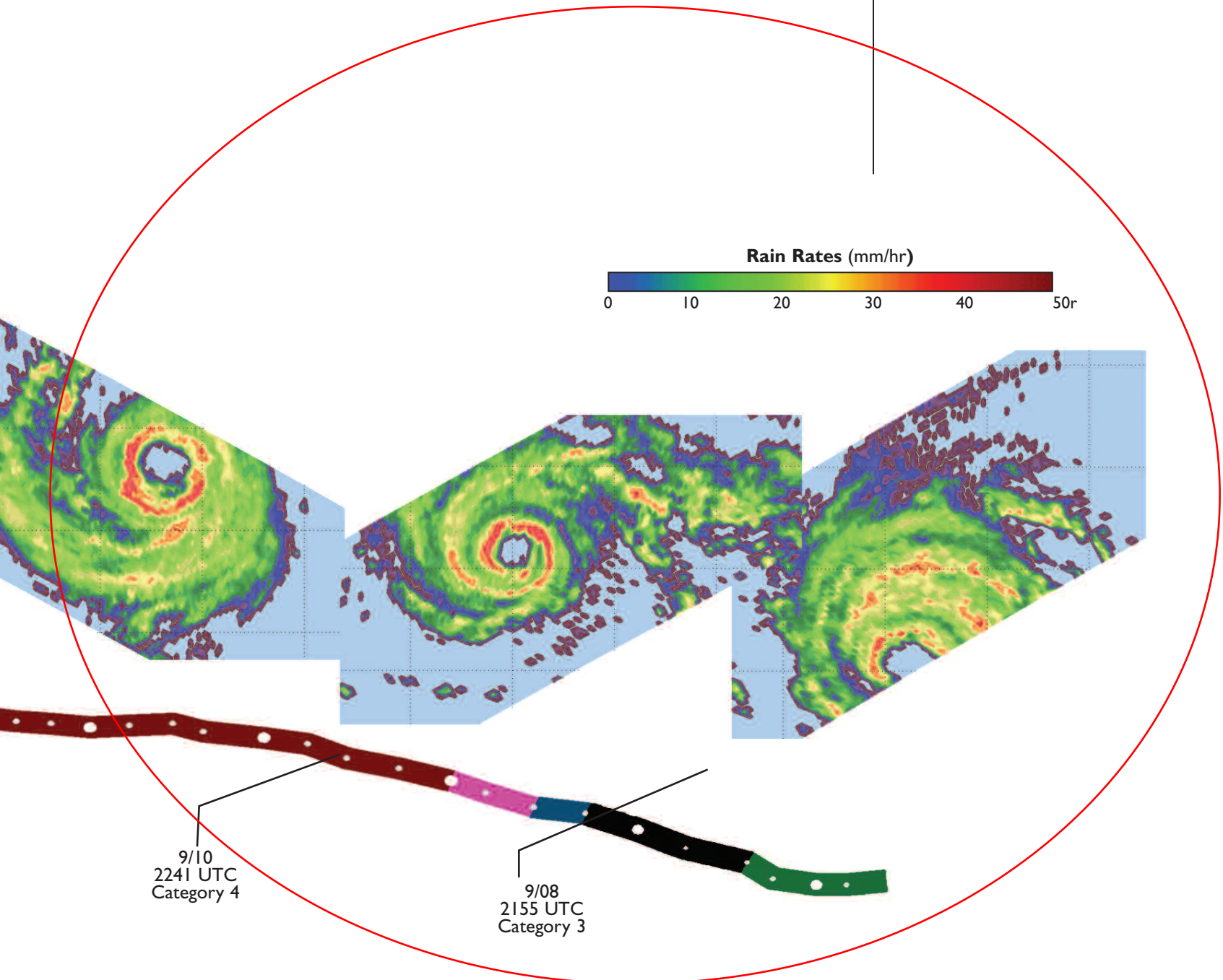


Sequence of satellite overpasses showing dramatic changes in rainfall structure of Hurricane Isabel during its trek across the Atlantic Ocean during September 2003. (Rain intensity data from the PR instrument on the TRMM satellite, visualization by Owen Kelley.)

Hurricanes, otherwise known as tropical cyclones and typhoons, are the most extreme manifestation of tropical storm clouds. Hurricanes consist of thunderstorms organized in spiral or circular bands, surrounding a central low-pressure vortex of intense wind. Considering that 1000–2000 ordinary thunderstorm cells are active at any instant around the globe, hurricanes are quite rare, as only 80 to 90 of them develop worldwide in any given year. While hurricanes are quite infamous for their powerful, gusty winds, storm surge, and inland flooding, they play a beneficial role in many parts of the world by supplying much-needed rainfall—up to 30–40% of the annual rainfall in some portions of the lower latitudes.

In the Atlantic Ocean, an average of about ten named storms is expected to develop each year. However, of all the tropical ocean basins that give rise to hurricanes, the Atlantic is considered marginal for hurricane formation. The ocean undergoes substantial variation in



the number of storms experienced annually. Part of the year-to-year variation is linked to the El Niño Southern Oscillation (ENSO), a vast coupling between tropical oceans and the atmosphere. In El Niño conditions, atmospheric pressure, winds, ocean temperature, and rainfall undergo marked changes on an irregular cycle that spans 2–5 years. Major shifts in the tropical atmospheric circulation cause winds to blow more strongly across the near-equatorial Atlantic ocean. These strong currents disrupt the early, fragile cores of the hurricane vortex, and so limit the number and intensity of Atlantic hurricanes.

Recent research has uncovered a unique aspect of the Atlantic basin that influences hurricane development—enormous clouds of dust lofted into the atmosphere off the African continent. Large plumes of Saharan dust occasionally interact with hurricane ‘seedlings’ or waves in the easterly trades that stream off Africa. When these disturbances are embedded